

E72-10061

CR-128135

Type I Progress Report

ERTS 1

a. Title: Thermal Surveillance of Volcanoes

ERTS 1 Proposal No.: SR 251

b. GSFC ID No. of P.I.: IN 023

c. Problems impeding progress of investigation

The chief impediment delaying a fully operational DCS thermal experiment in the Cascade Range has been the delayed delivery of operational DCS platforms by General Electric of Daytona to the USGS Instrument Development Laboratory at the Mississippi Test Facility (MTF), where ground sensor systems are being built. None of the five DCS platforms designated for experiment 251 has been delivered. Two nondesignated sets available at MTF are being modified for experiment 251, but these sets, one of which has been set up at MTF for experimental signal transmission to ERTS 1, need modification to correct for excessive humidity sensitivity. This delay will cause logistic difficulties and added expense (e.g., additional helicopter support will be needed to reach high-altitude sites in the Cascades after the early fall snows begin).

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VOLCANOES Progress Report, 1 Jul. - 31  
Aug. 1972 J.D. Friedman (Geological  
Survey)

Another important problem is the lack of ERTS imagery for the Cascades and Iceland sites, i.e., RBV images have been recorded over the Cascades but have not yet been processed; and no coverage has been recorded over Iceland. The Cascades' imagery is important for the final stages of ground sensor (DCS) site selection and emplacement--the DCS sites should be selected at identifiable locations on the images.

For the Iceland part of experiment 251, the lack of MSS imagery is particularly critical because no DCS sites are possible there. MSS image coverage is essential during the late summer period before fall snows obscure the structural and volcanic features to be studied. Then, comparative MSS images will be needed for the fall and winter.

d. Accomplishments during initial reporting period  
((July 1 - September 1, 1972)).

(1) The first round of seasonal aerial infrared scanner missions over Lassen Volcanic National Park, Mount Rainier, Mount Saint Helens, and Mount Baker have been successfully completed under USGS and USFS auspices. Thermal anomalies of volcanic or geothermal origin at the prospective DCS sites were recorded on film and have been plotted on topographic base maps.

(2) Ground reconnaissance of the Lassen, Mount Baker, and Mount Saint Helens sites has been completed and prospective sites for emplacement of DCS sets have been selected (pending receipt of the first MSS or RBV image coverage). Ground temperature measurements were made at the surface of anomalously warm areas and, where possible, at shallow depth to determine the near-surface temperature gradient. The geothermal nature of the anomalies at the selected sites has thus been verified.

(3) Five thermistor arrays consisting of eight probes each and appropriate interfacing for the G.E. DCS platforms and transmitter sets have been essentially completed and we are awaiting receipt of the modified DCS sets at the Mississippi Test Facility.

(4) A USGS computer program has been set up to interpret experiment 251 DCS data which will be received in punchcard format as sent out from Goddard Spaceflight Center. The main USGS program will produce a weekly written report on a standard printer and a cumulative nine-track tape record. A Data Presentation System plot routine will display a monthly graph of fumaroles, ground and shallow subsurface temperatures of the Cascades' sites, as well as convective heat flow and radiance calculations for selected thermistor probes.

e. Significant scientific results

A systematic aircraft program to monitor changes in the thermal emission from volcanoes of the Cascade Range has been initiated by the U.S. Geological Survey and is being carried out in conjunction with ERTS-1 thermal surveillance experiments. Night overflights by U.S. Forest Service, NASA MSC, and other available aircraft equipped with thermal infrared scanners sensitive to terrestrial emission in the 4-5.5 and 8-14  $\mu\text{m}$  bands are currently being carried out at intervals of a few months. Preliminary results confirm that Mount Rainier, Mount Baker, Mount Saint Helens, Mount Shasta, and the Lassen area continue to be thermally active, although with the exception of Lassen which erupted between 1914 and 1917, and Mount Saint Helens which had a series of eruptions between 1831 and 1834, there has been no recent eruptive activity. Excellent quality infrared images recorded over Mount Rainier, as recently as April, 1972, show similar thermal patterns to those reported in 1964-1966. Infrared images of Mount Baker recorded in November 1970 and again in April 1972 revealed a distinct array of anomalies 1,000 feet below the crater rim and associated with fumaroles or structures permitting convective heat transfer to the surface.

(Category (C) 3C)

f. A listing of published articles, etc.

None.

g. Recommendation for maximum utilization of the  
ERTS-1 system

See item c. The scheduling of MSS recording time over Iceland before the end of the summer season is essential to success of the Iceland part of this experiment; therefore, a special appeal is hereby made for priority on a minimum of satellite tape recorder time to achieve this goal, in order to carry out the objectives mutually agreed upon in the work statement of NASA SR 251.

Similarly, it is assumed that the DCP sets will be received in modified form and in working order so that they may be laboratory tested for one week (at MTF) and then emplaced at already selected sites in the Cascade Range before the end of the summer season.

h. A listing of changes in Standing Order forms

None submitted from project office, but see Mr. Ed Crump, Technical Monitor, for any changes in Standing Order forms submitted by his office.

i. ERTS Image Descriptor forms

Will provide ERTS Image Descriptor forms when ERTS imagery over experiment areas is received.

j. Listing by date of any changed Data Request forms

See item h.

k. Status of DCP

See item c. Data Collection Platforms not yet  
received (as of August 25, 1972).

